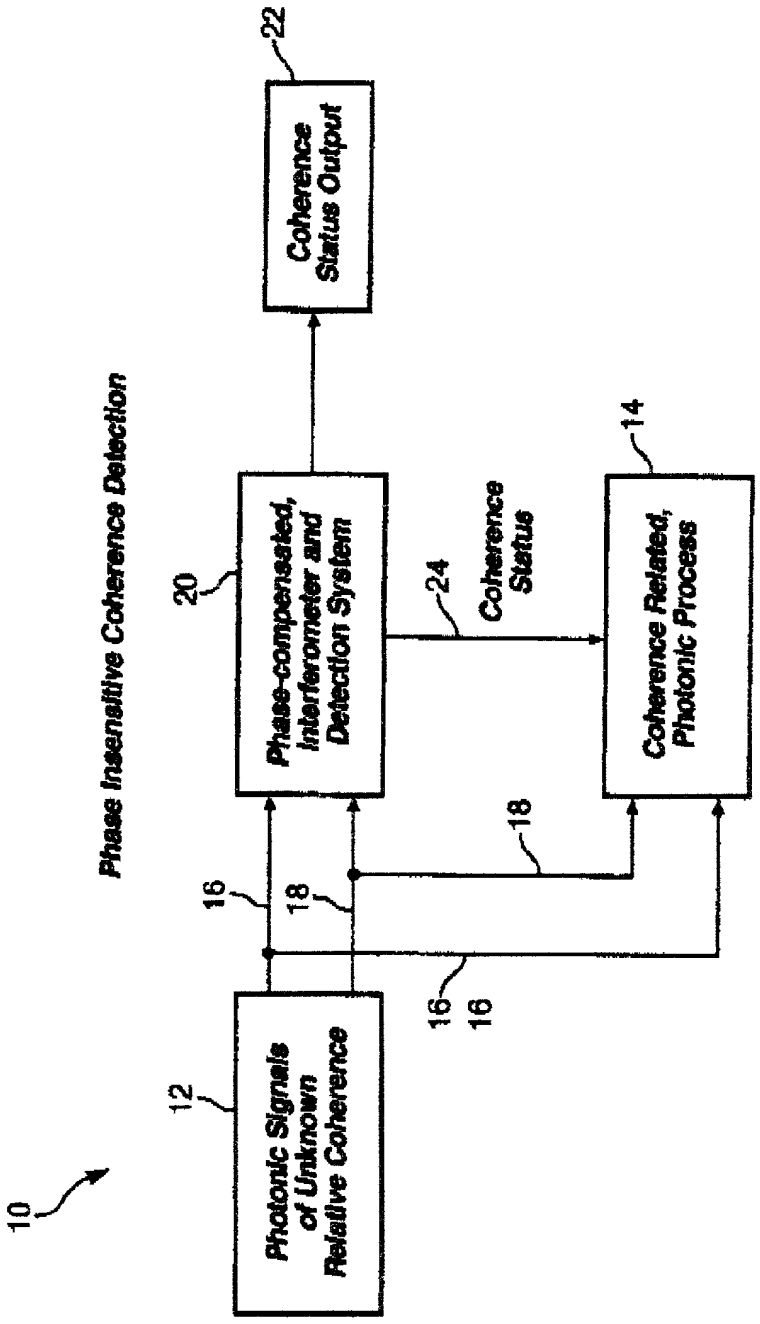
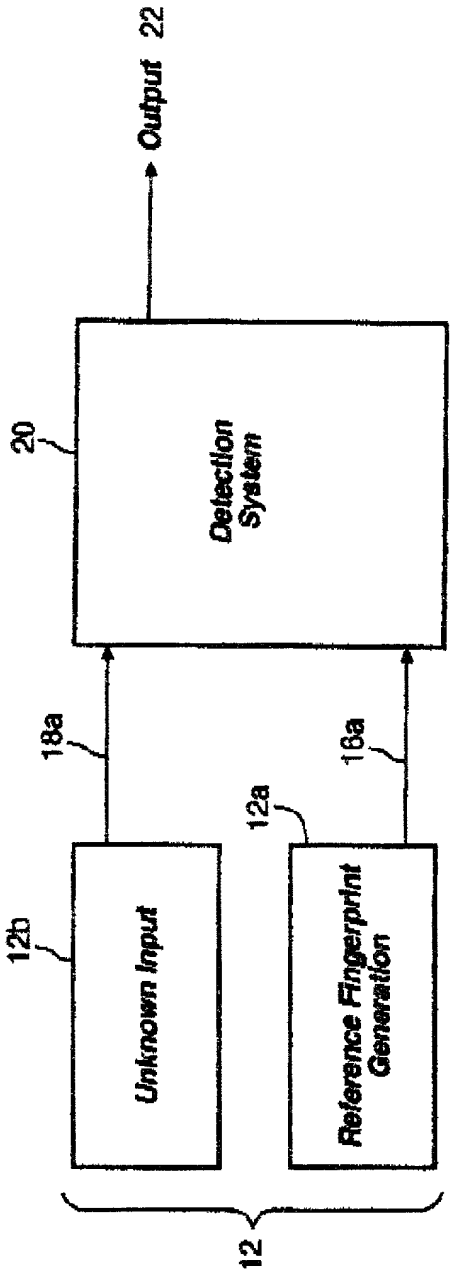
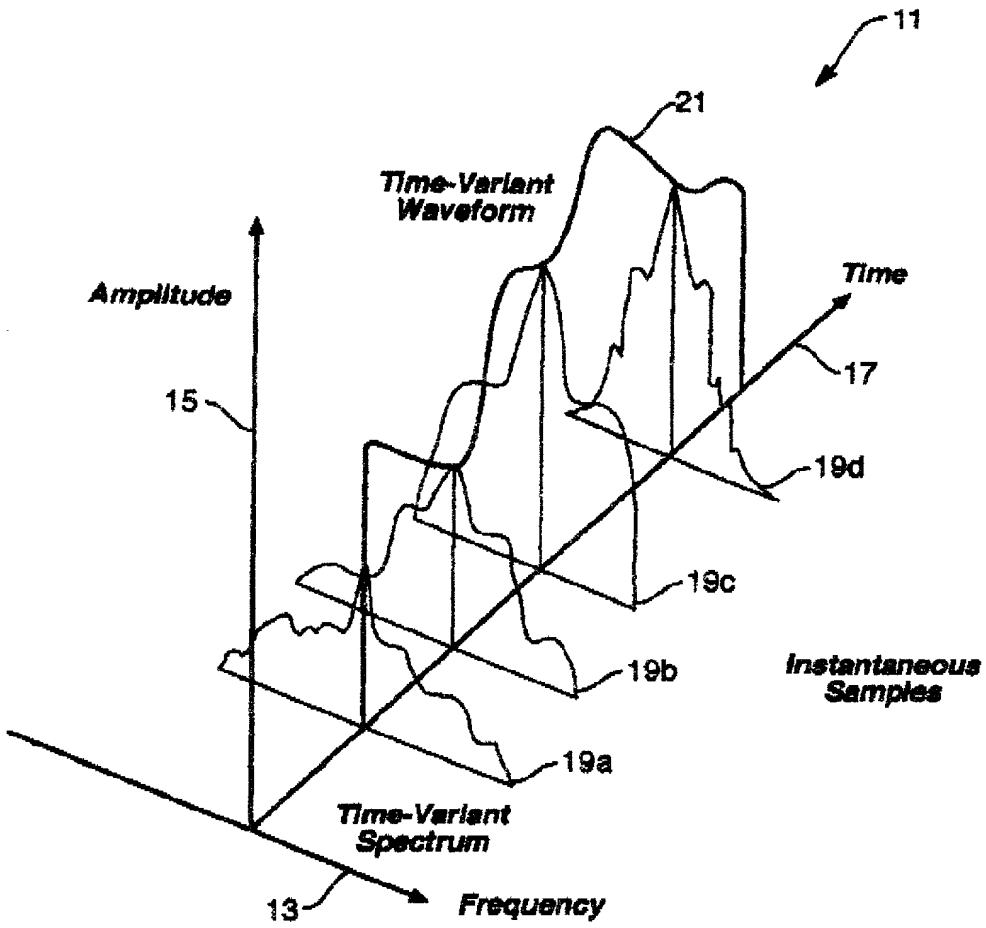

Phase Insensitive Coherence Detection
10
12
Photonic Signals of Unknown Relative Coherence
16
18
16
16
18
20
Phase-compensated, Interferometer and Detection System
24
Coherence Status
14
Coherence Related, Photonic Process
22
Coherence Status Output

FIG. 1



Photonic Fingerprint Analyzer and Coincidence Detector

FIG. 2



Photonic Fingerprint

FIG. 3

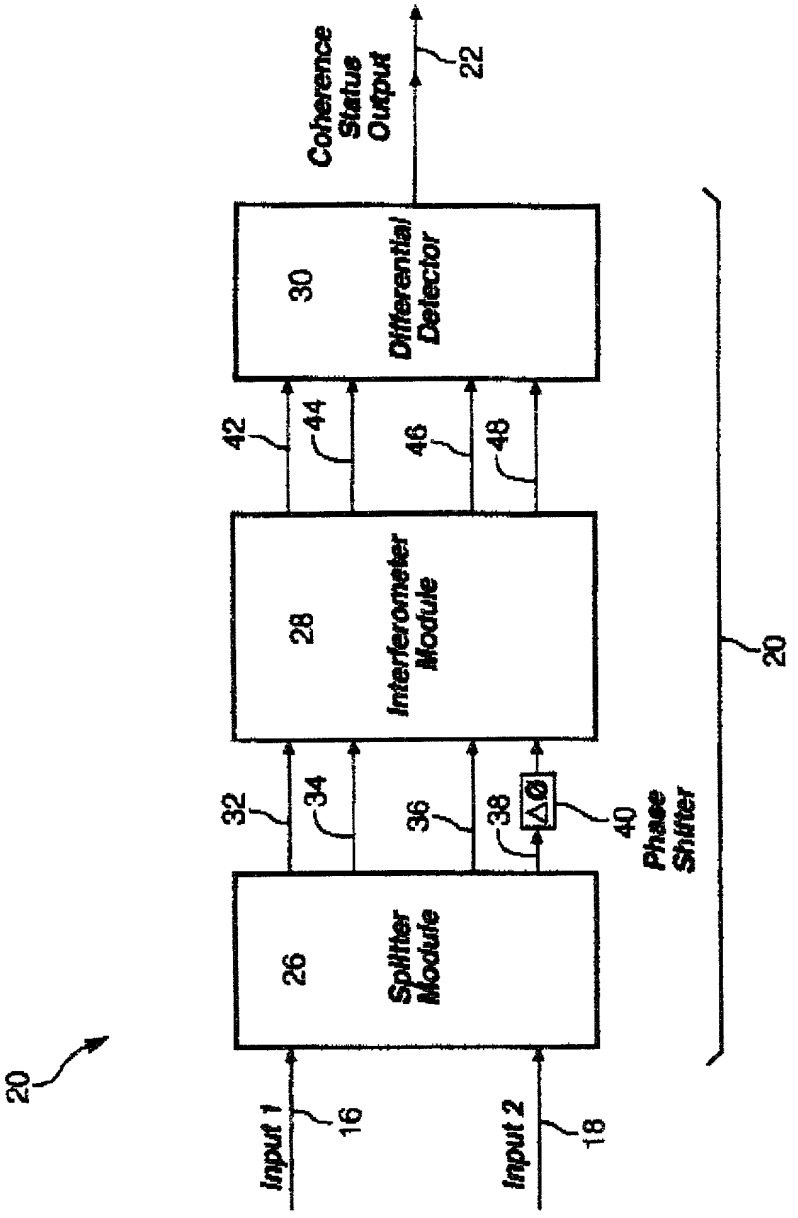

20
Input 1
16
Input 2
18
26
Splitter Module
32
34
36
38
ΔØ
40
Phase Shifter
28
Interferometer Module
42
44
46
48
30
Differential Detector
Coherence Status Output
22
20

FIG. 4

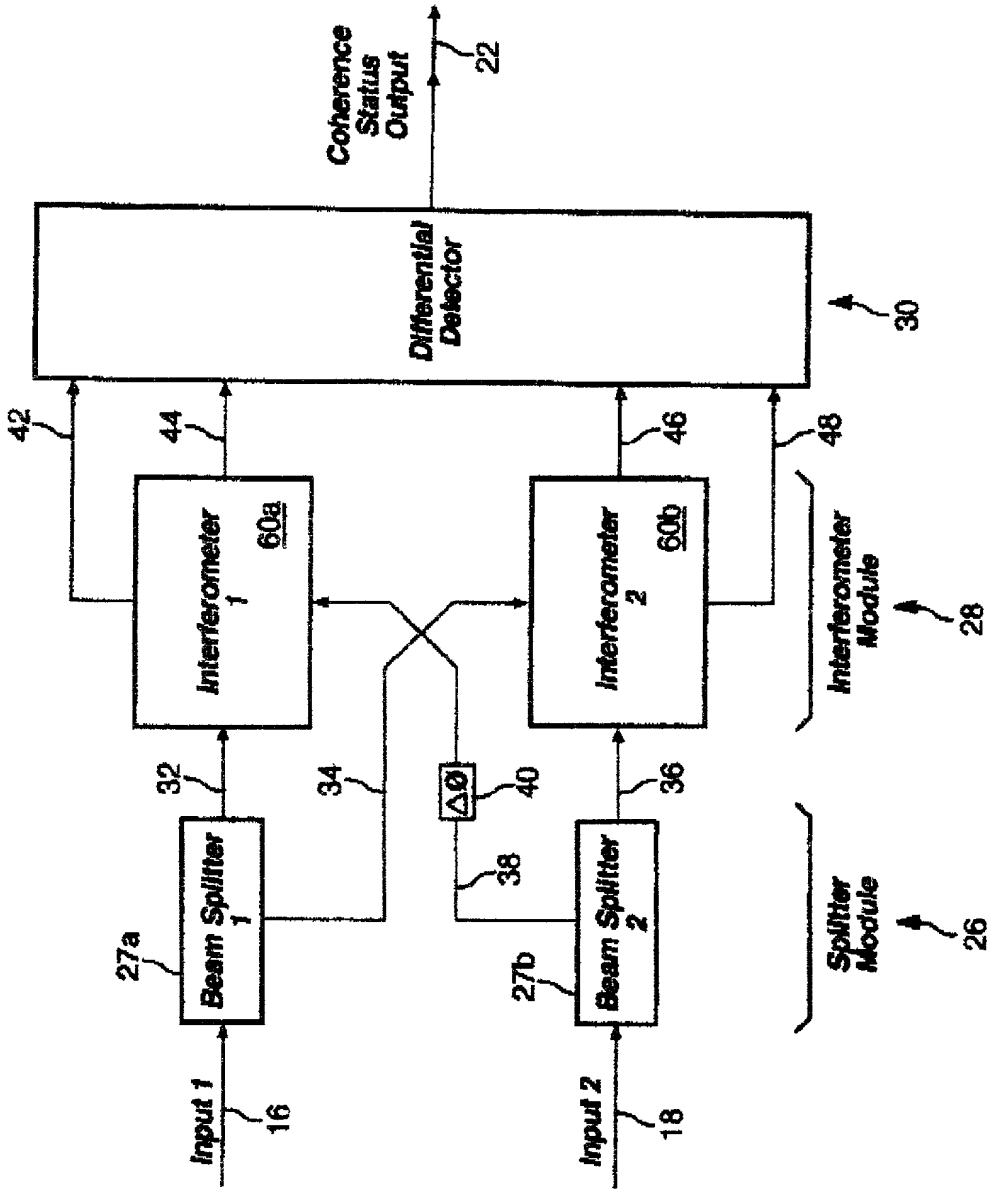

Coherence Status Output
22
Differential Detector
30
42
44
46
48
Interferometer 1
60a
Interferometer 2
60b
Interferometer Module
28
32
34
Δø
40
36
38
Beam Splitter 1
27a
Beam Splitter 2
27b
Splitter Module
26
Input 1
16
Input 2
18

FIG. 5

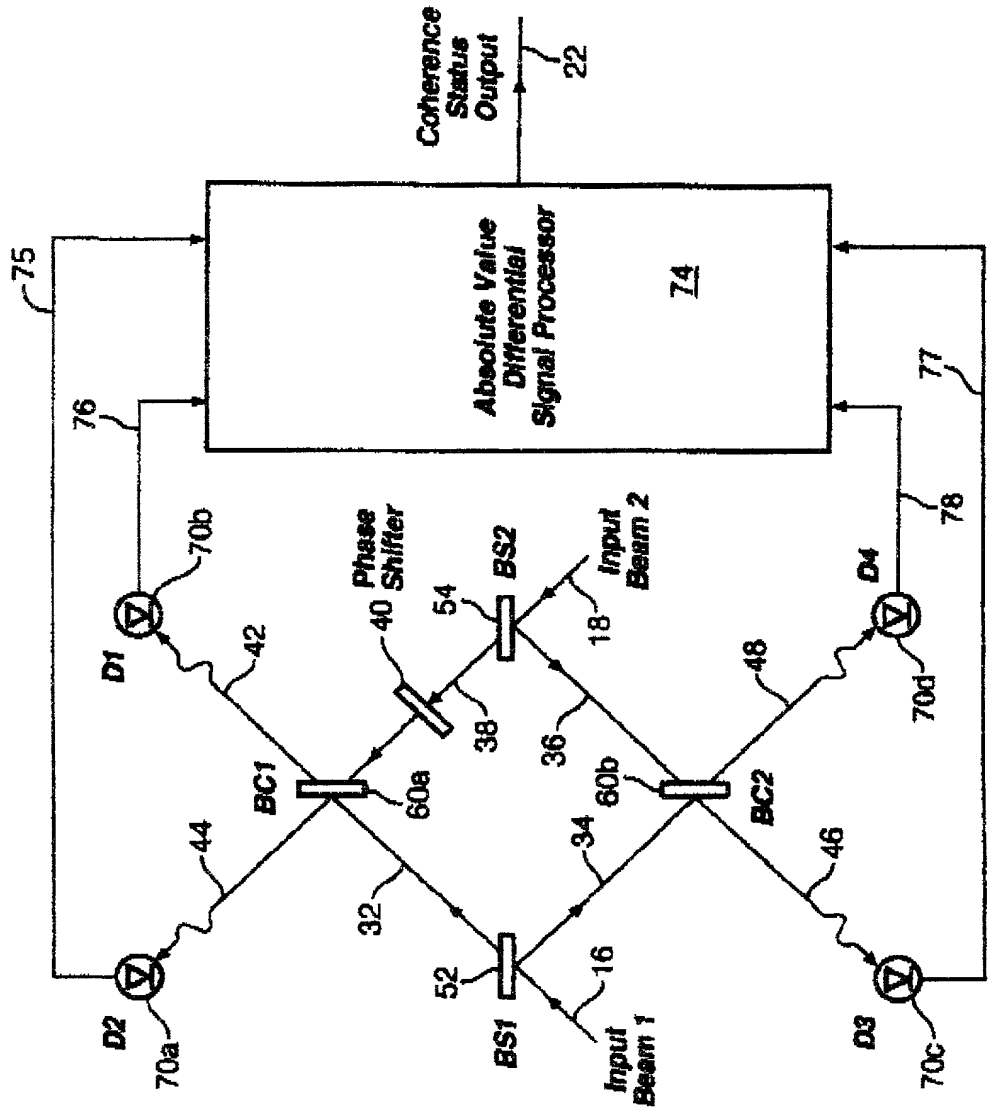

Coherence Status Output
22
Absolute Value Differential Signal Processor
74
75
76
77
78
D1
D2
D3
D4
70a
70b
70c
70d
BS1
BS2
BC1
BC2
Phase Shifter
40
Input Beam 1
16
Input Beam 2
18
32
34
36
38
42
44
46
48
52
54
60a
60b

FIG. 6

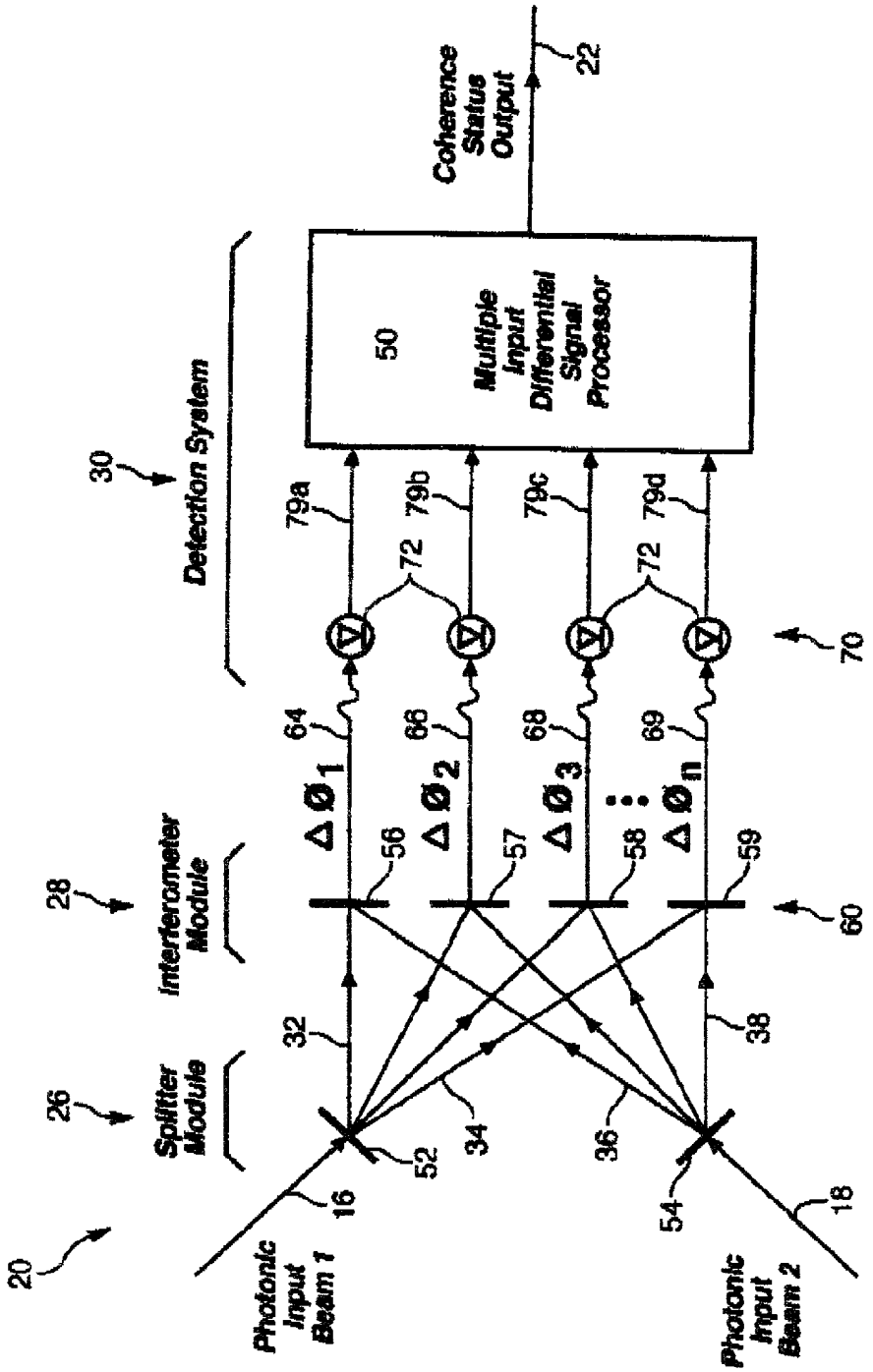

20
Photonic Input Beam 1
16
26
Splitter Module
28
Interferometer Module
30
Detection System
32
52
34
36
54
18
Photonic Input Beam 2
38
56
57
58
59
60
64
66
68
69
70
72
79a
79b
79c
79d
50
Multiple Input Differential Signal Processor
Coherence Status Output
22

FIG. 7

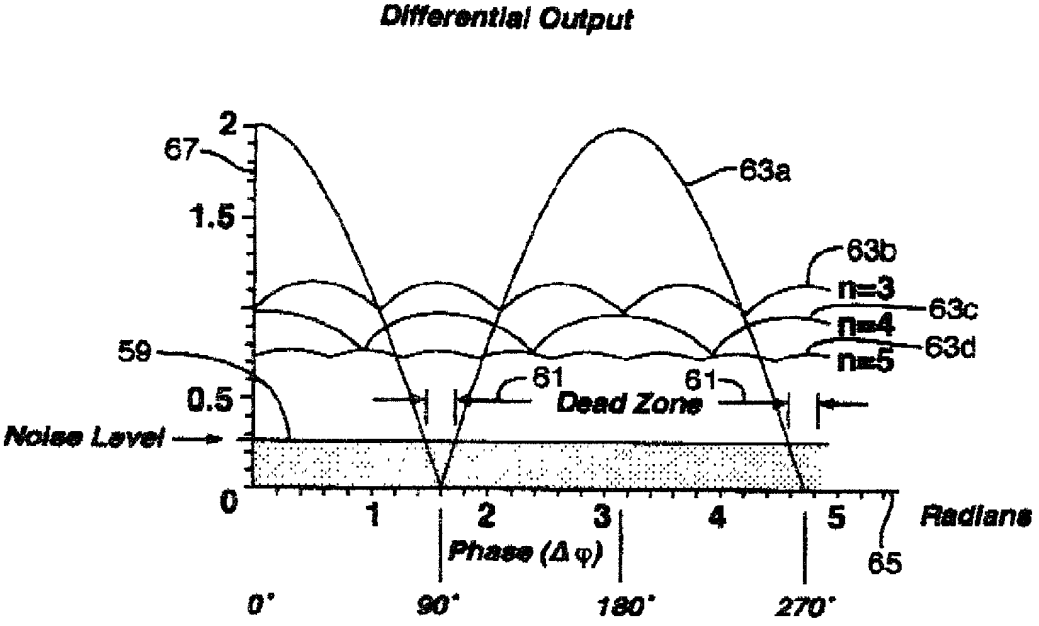

Differential Output
2
67
1.5
59
0.5
Noise Level
0
63a
63b
n=3
63c
n=4
63d
n=5
61
Dead Zone
61
1
2
3
4
5
Radians
65
Phase (Δ φ)
0°
90°
180°
270°

FIG. 8

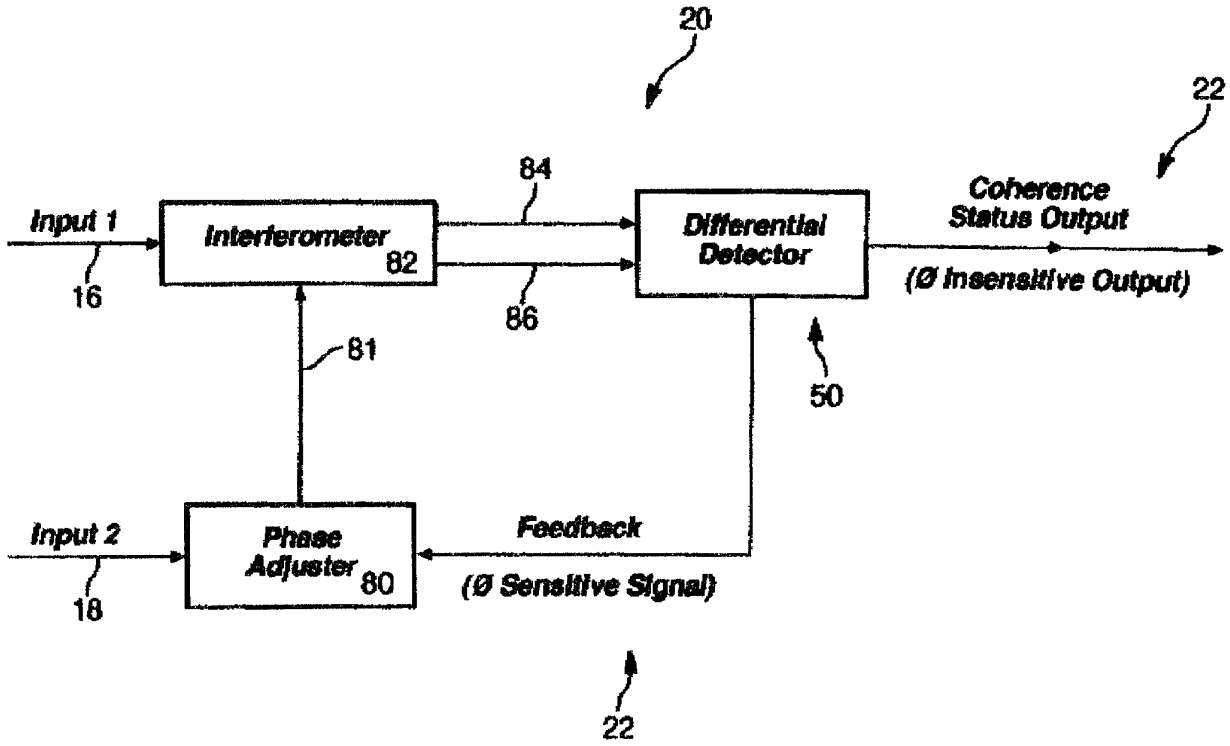

20
22
84
Input 1
Interferometer
82
Differential
Detector
Coherence
Status Output
(Ø Insensitive Output)
16
86
81
50
Input 2
Phase
Adjuster
80
Feedback
(Ø Sensitive Signal)
18
22

FIG. 9

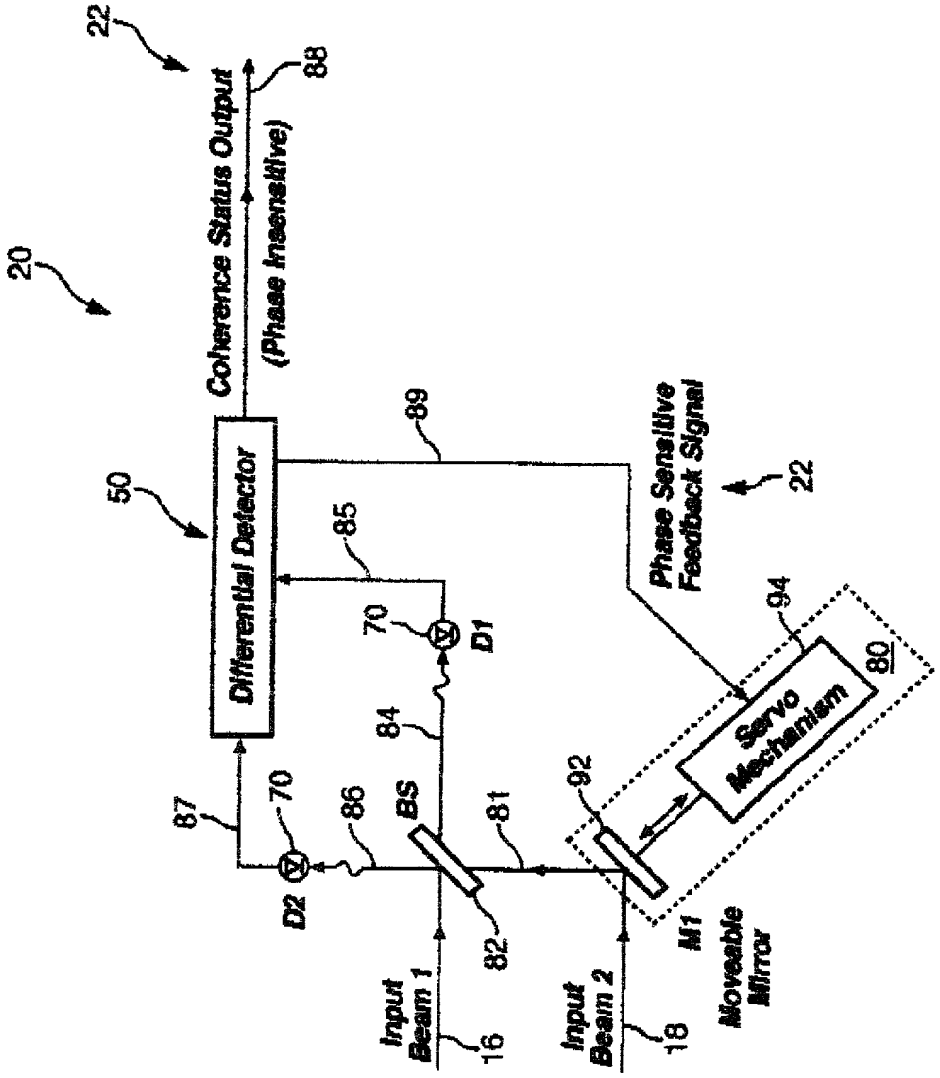

22
Coherence Status Output
(Phase Insensitive)
88
20
50
Differential Detector
89
Phase Sensitive
Feedback Signal
22
85
70
D1
94
Servo
Mechanism
80
84
87
70
86
BS
81
92
D2
82
Input
Beam 1
16
Input
Beam 2
18
M1
Moveable
Mirror

FIG. 10

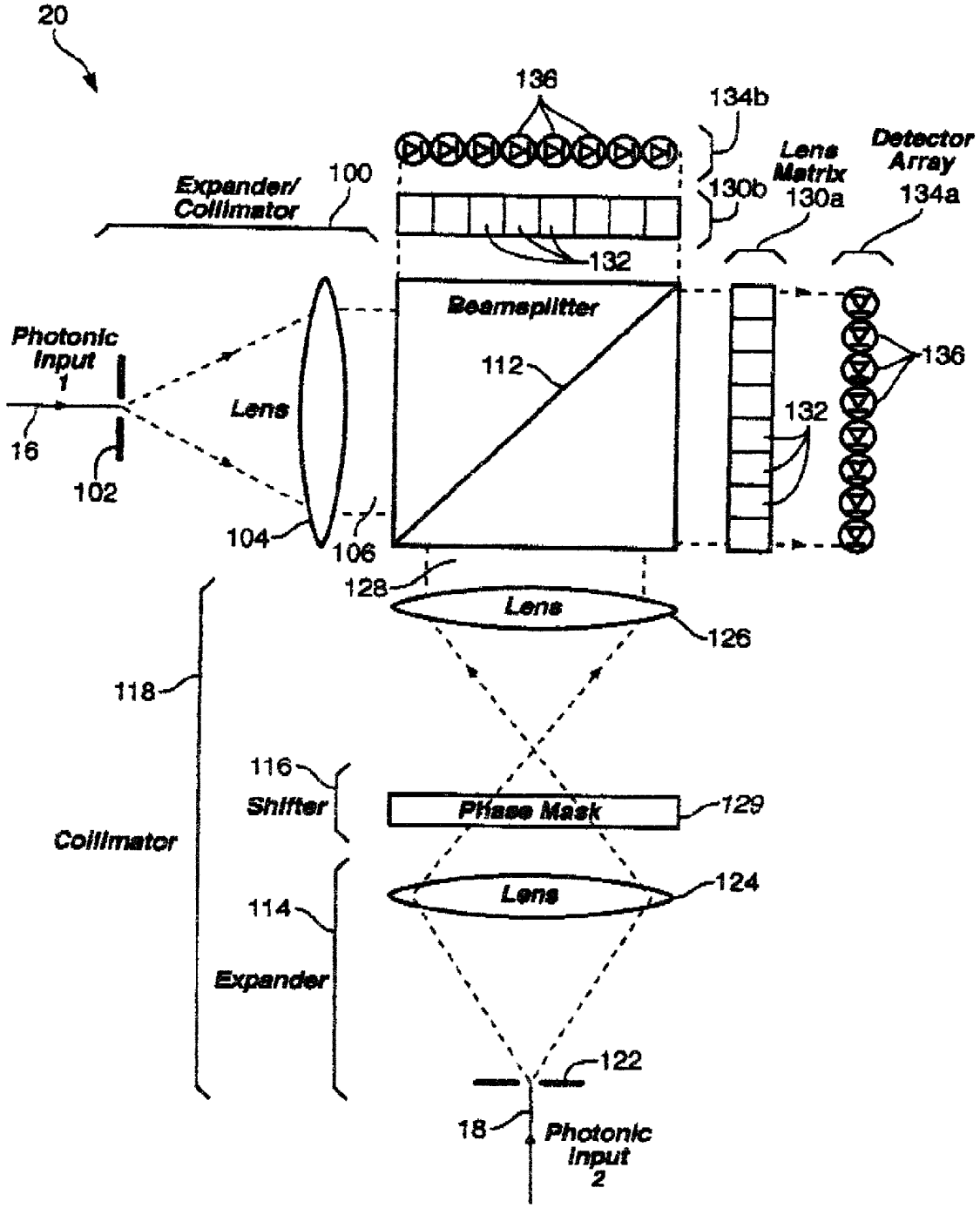

20
136
134b
Lens Matrix
Detector Array
Expander/ Collimator
100
130b
130a
134a
132
Beamsplitter
Photonic Input 1
112
Lens
136
16
132
102
104
106
128
Lens
126
118
116
Shifter
Phase Mask
129
Collimator
Lens
124
114
Expander
122
18
Photonic Input 2

FIG. 11

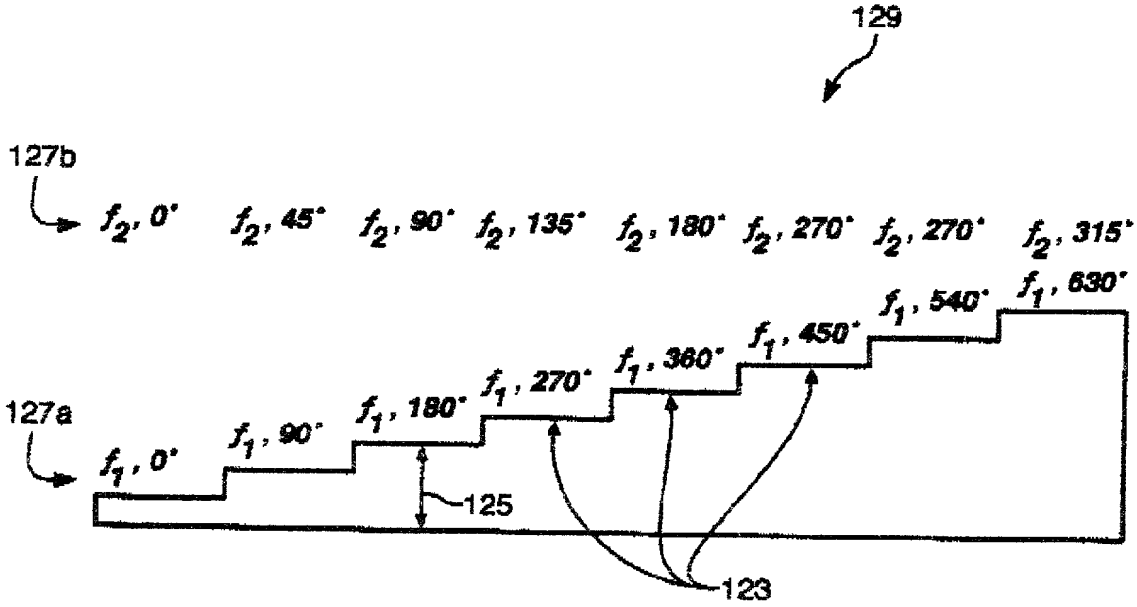

129
127b
f_2, 0°
f_2, 45°
f_2, 90°
f_2, 135°
f_2, 180°
f_2, 270°
f_2, 270°
f_2, 315°
f_1, 630°
f_1, 540°
f_1, 450°
f_1, 360°
f_1, 270°
f_1, 180°
f_1, 90°
f_1, 0°
127a
125
123

FIG. 12

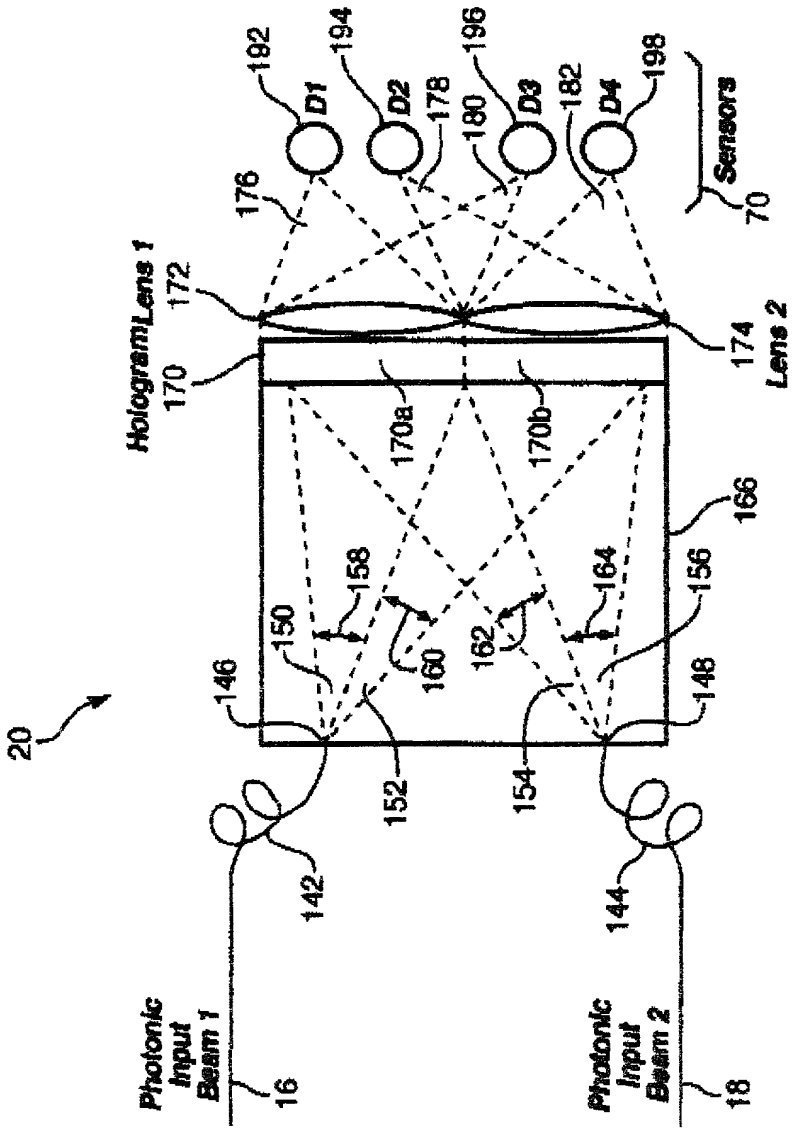

20
Photonic Input Beam 1
16
Photonic Input Beam 2
18
142
144
146
148
150
152
154
156
158
160
162
164
166
Hologram Lens 1
170
170a
170b
172
174
Lens 2
176
178
180
182
192
194
196
198
D1
D2
D3
D4
Sensors
70

FIG. 13

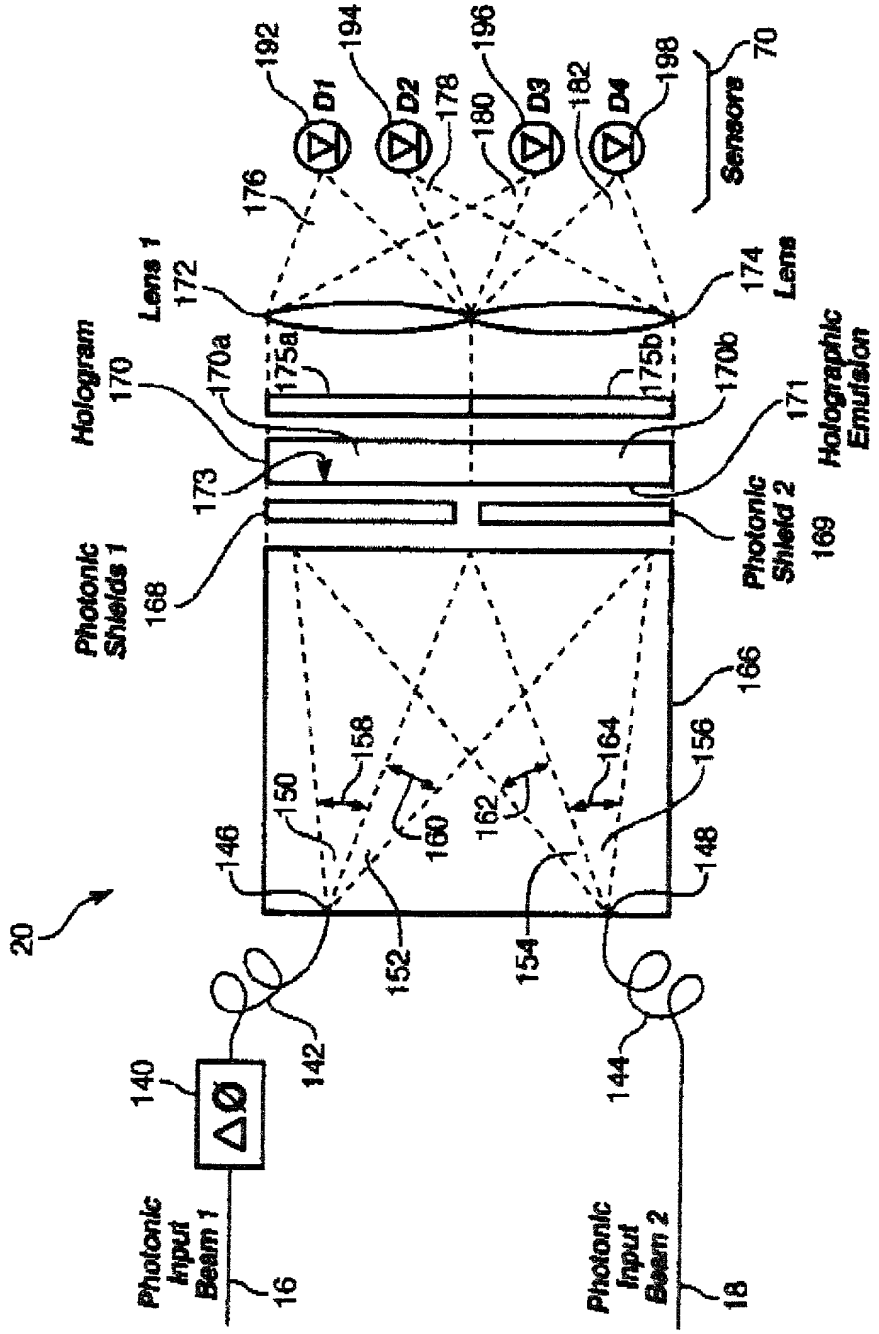

20
Photonic Input Beam 1
16
Photonic Input Beam 2
18
140
ΔØ
142
144
146
148
150
152
154
156
158
160
162
164
166
Photonic Shields 1
168
Hologram
170
170a
170b
171
Holographic Emulsion
Photonic Shield 2
169
173
Lens 1
172
Lens
174
175a
175b
176
D1
192
D2
194
178
D3
196
180
D4
182
198
Sensors
70

FIG. 14

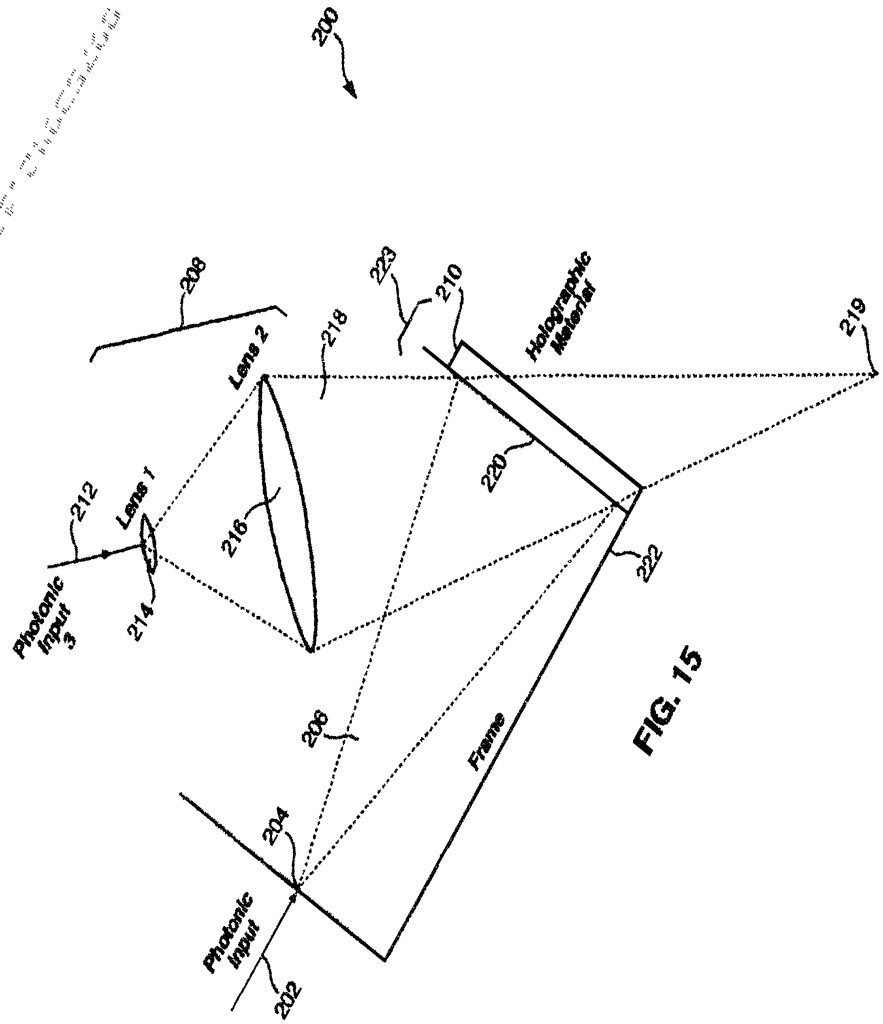

300
208
223
210
Holographic Material
219
Lens 2
218
220
212
Lens 1
216
Photonic Input 3
214
222
208
Frame
204
Photonic Input
202

FIG. 15

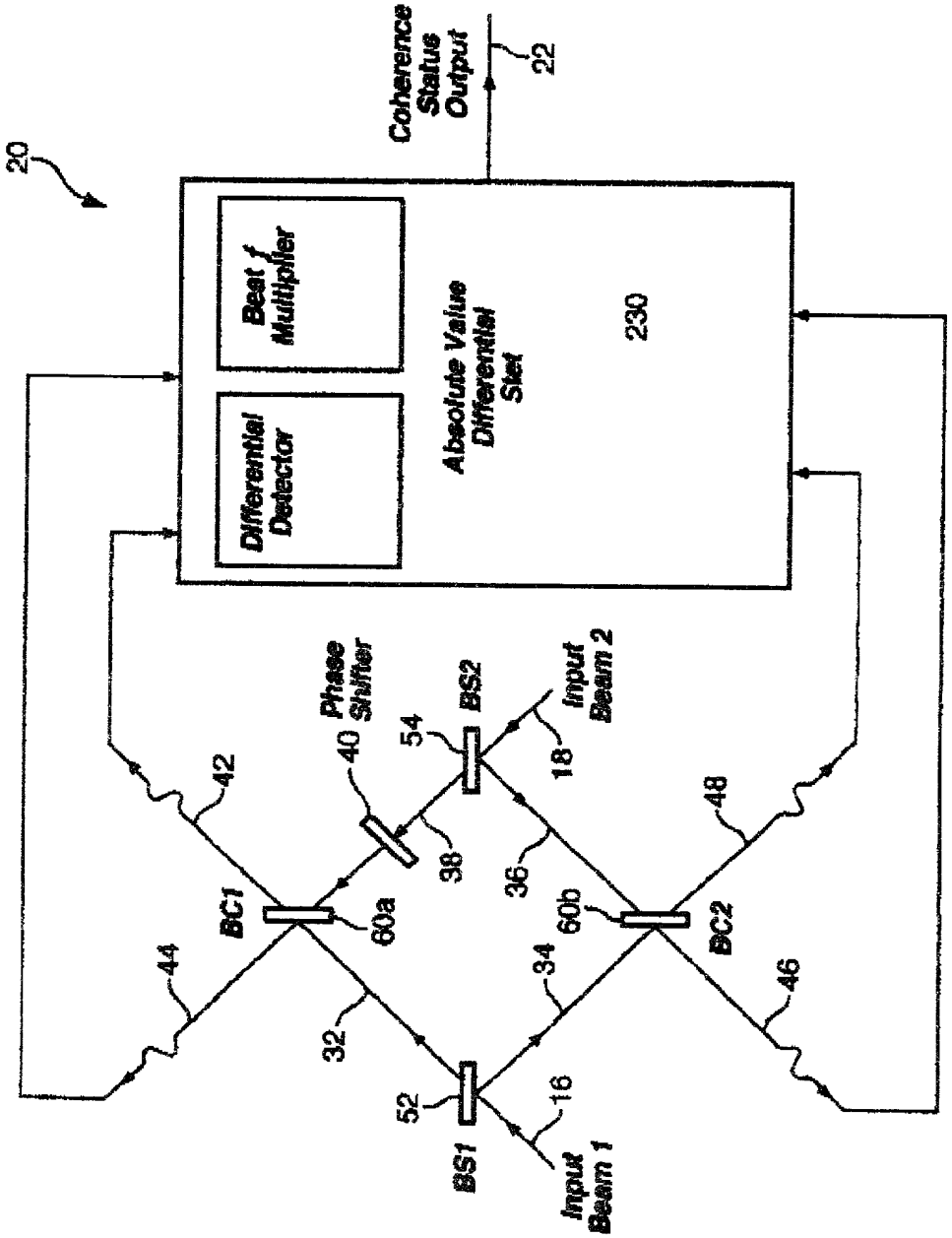
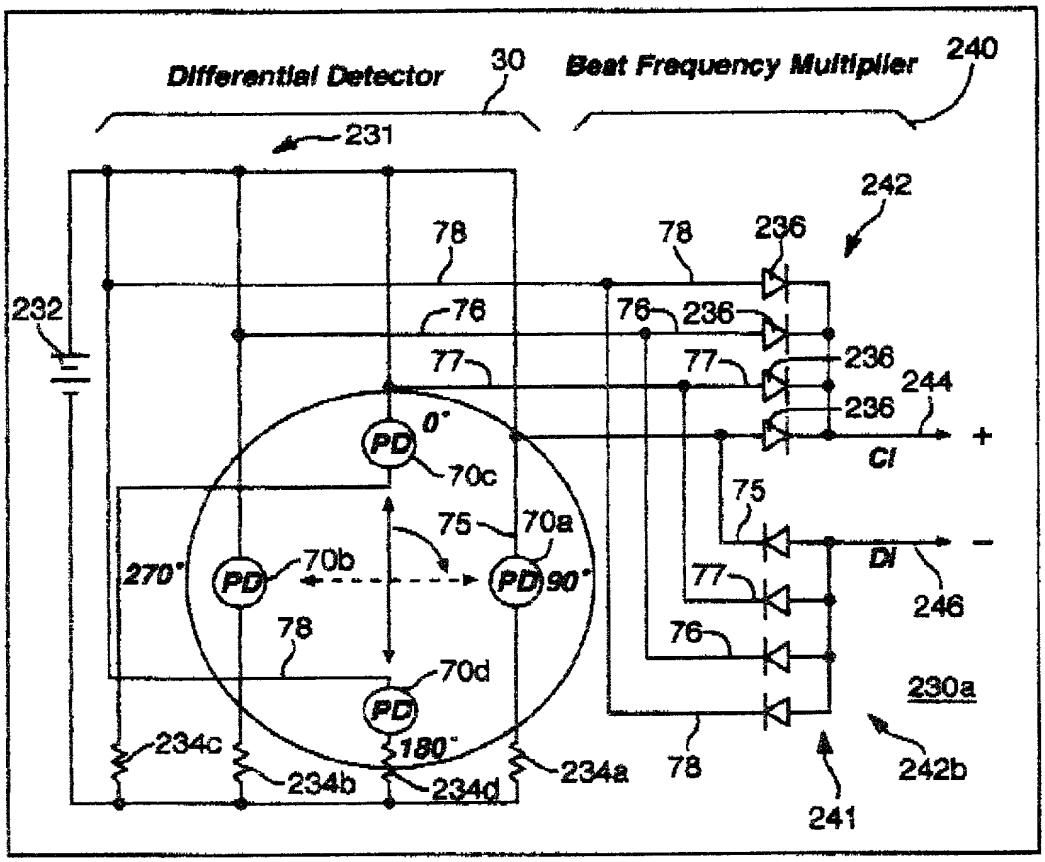

20
Coherence Status Output
22
Beat f Multiplier
Differential Detector
Absolute Value Differential Stet
230
Phase Shifter
40
54
BS2
Input Beam 2
18
42
48
38
36
BC1
60a
60b
BC2
44
34
46
32
52
16
BS1
Input Beam 1

FIG. 16



Absolute Value Differential Detector With Beat Frequency Multiplication

FIG. 17

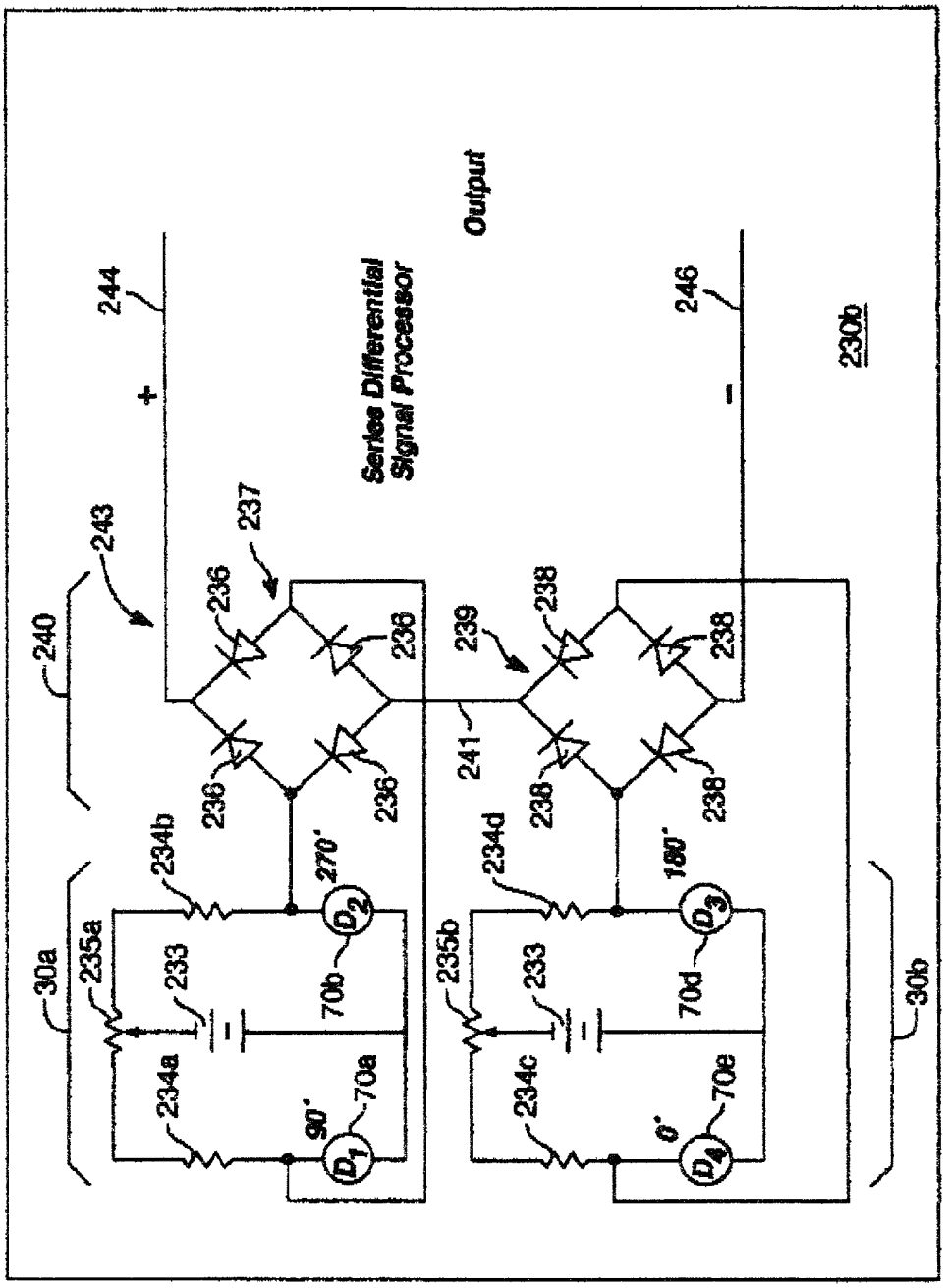

Series Differential
Signal Processor
Output
244
246
240
243
237
239
241
30a
30b
230b
235a
235b
233
234a
234b
234c
234d
236
238
70a
70b
70d
70e
90°
270°
180°
0°
D1
D2
D3
D4
+
-

FIG. 18

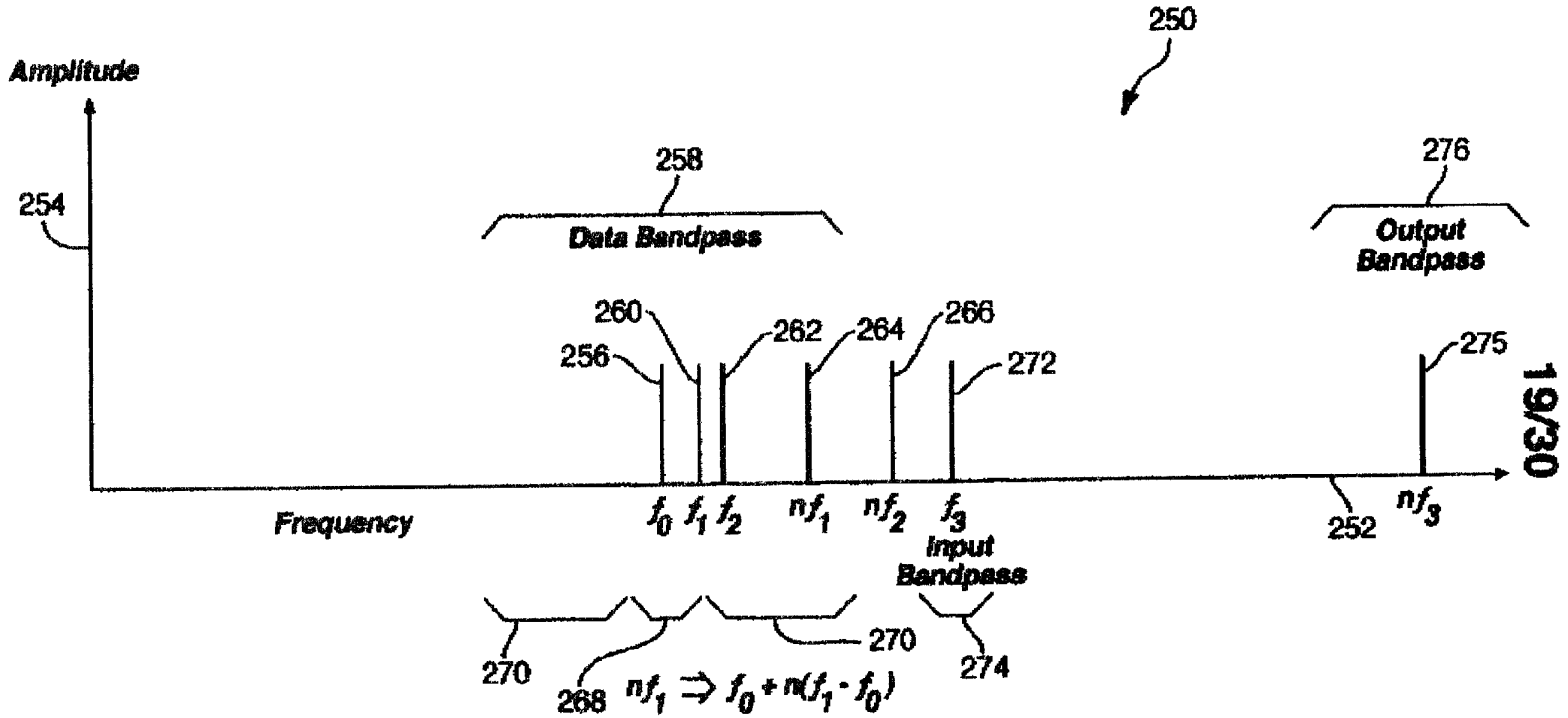

250
Amplitude
254
258
Data Bandpass
276
Output Bandpass
260
262
264
266
256
272
275
Frequency
f_0 f_1 f_2
nf_1
nf_2
f_3
252
nf_3
Input Bandpass
270
270
268
$nf_1 \Rightarrow f_0 + n(f_1 - f_0)$
274

FIG. 19

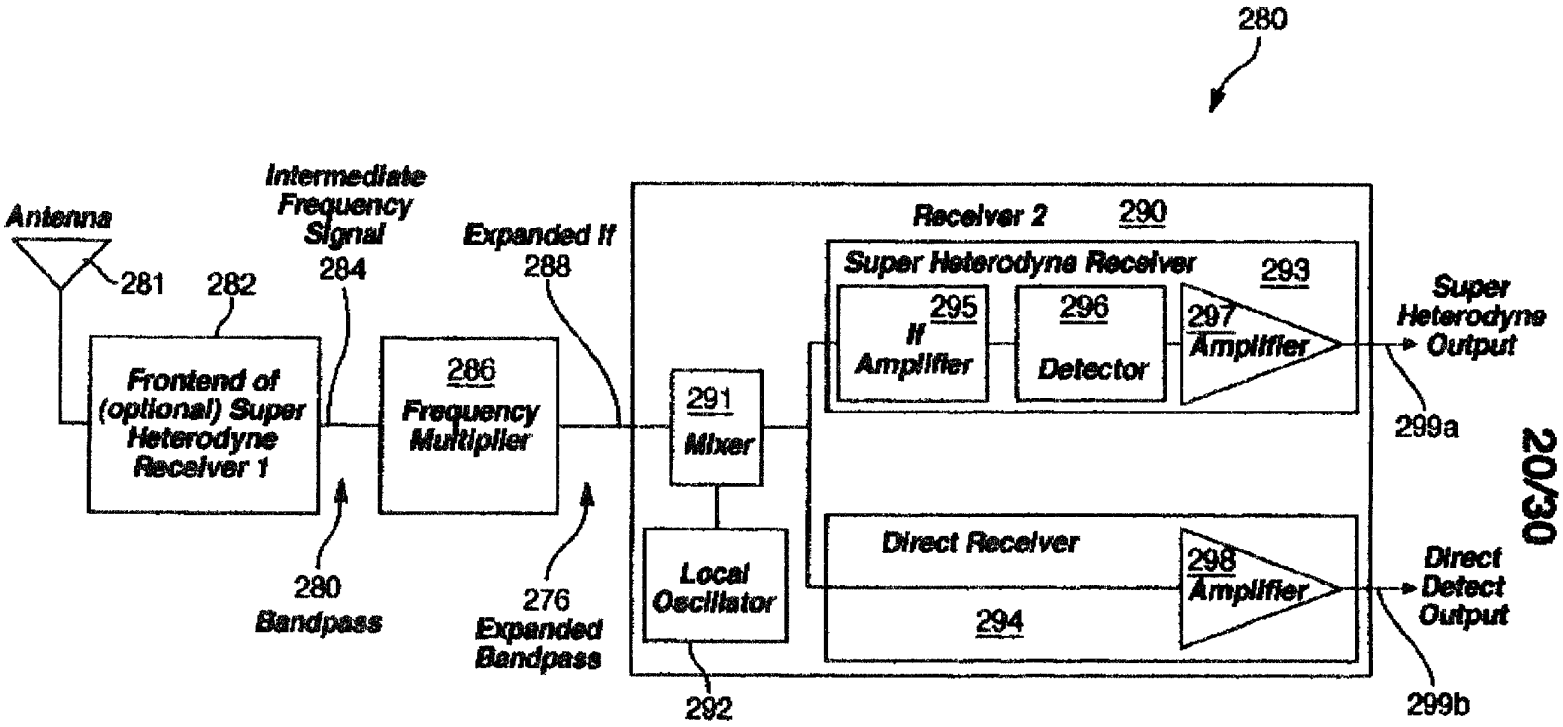

280
Antenna
281
282
Intermediate Frequency Signal
284
Expanded If
288
Receiver 2
290
Super Heterodyne Receiver
293
295
If Amplifier
296
Detector
297
Amplifier
Super Heterodyne Output
299a
Frontend of (optional) Super Heterodyne Receiver 1
286
Frequency Multiplier
291
Mixer
280
Bandpass
276
Expanded Bandpass
Local Oscillator
292
Direct Receiver
298
Amplifier
294
Direct Detect Output
299b

FIG. 20

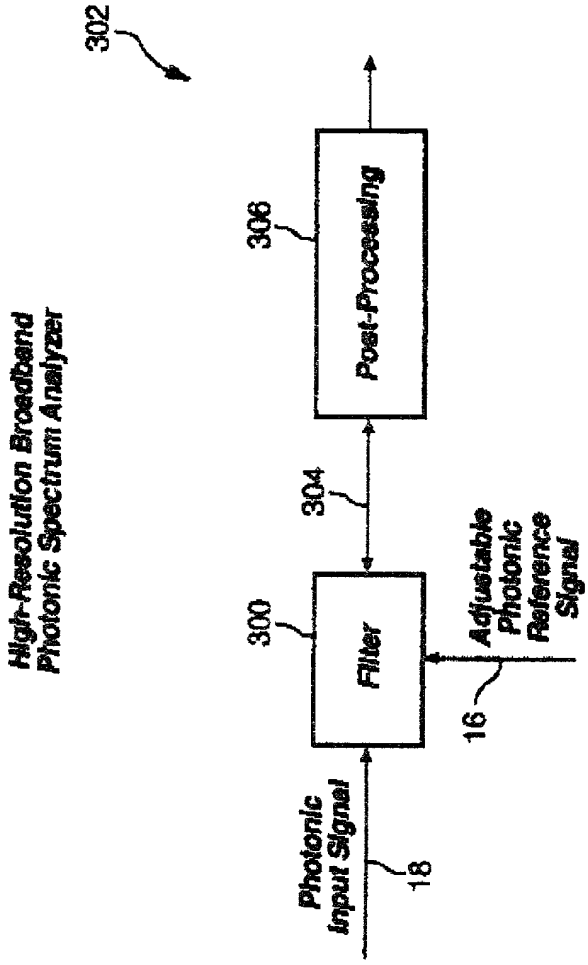

302
High-Resolution Broadband
Photonic Spectrum Analyzer
306
Post-Processing
304
300
Filter
Adjustable
Photonic
Reference
Signal
16
Photonic
Input Signal
18

FIG. 21

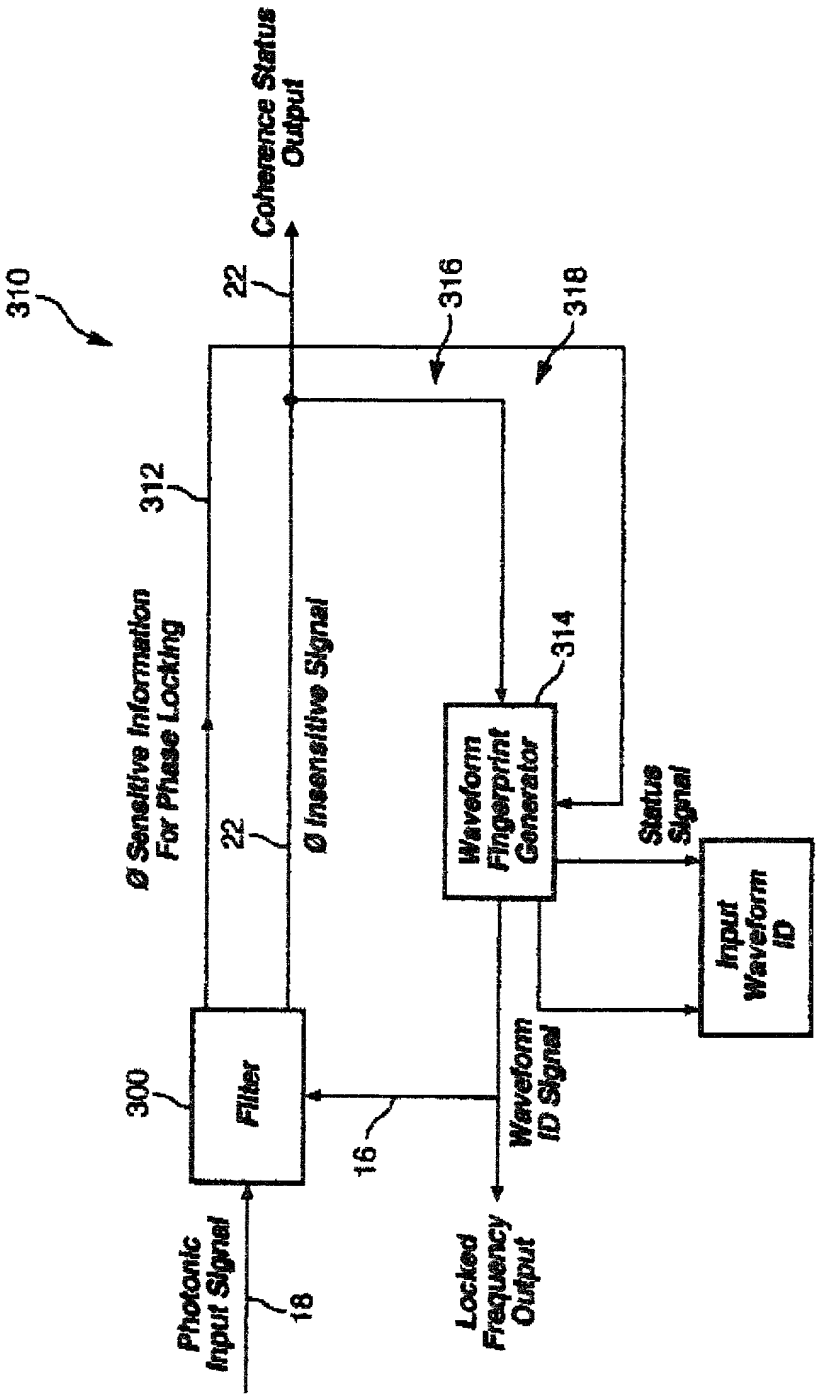

310
Coherence Status Output
22
316
318
312
Ø Sensitive Information For Phase Locking
Ø Insensitive Signal
22
314
Waveform Fingerprint Generator
Status Signal
Input Waveform ID
300
Filter
16
Waveform ID Signal
Photonic Input Signal
18
Locked Frequency Output

FIG. 22

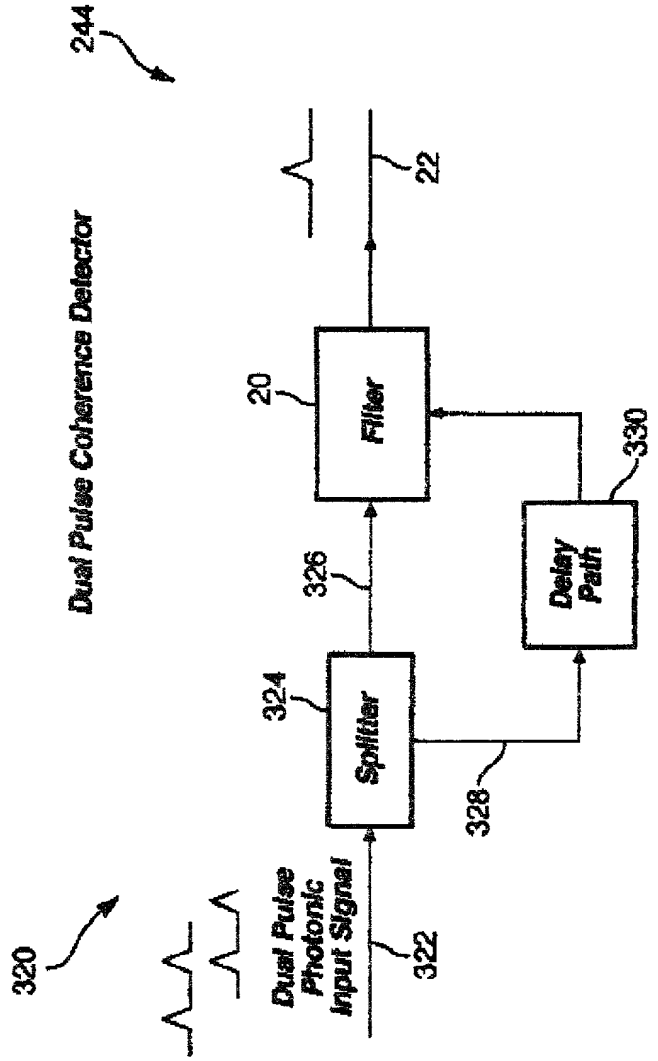

244
Dual Pulse Coherence Detector
320
Dual Pulse Photonic Input Signal
322
324
Splitter
326
328
Delay Path
330
20
Filter
22

FIG. 23

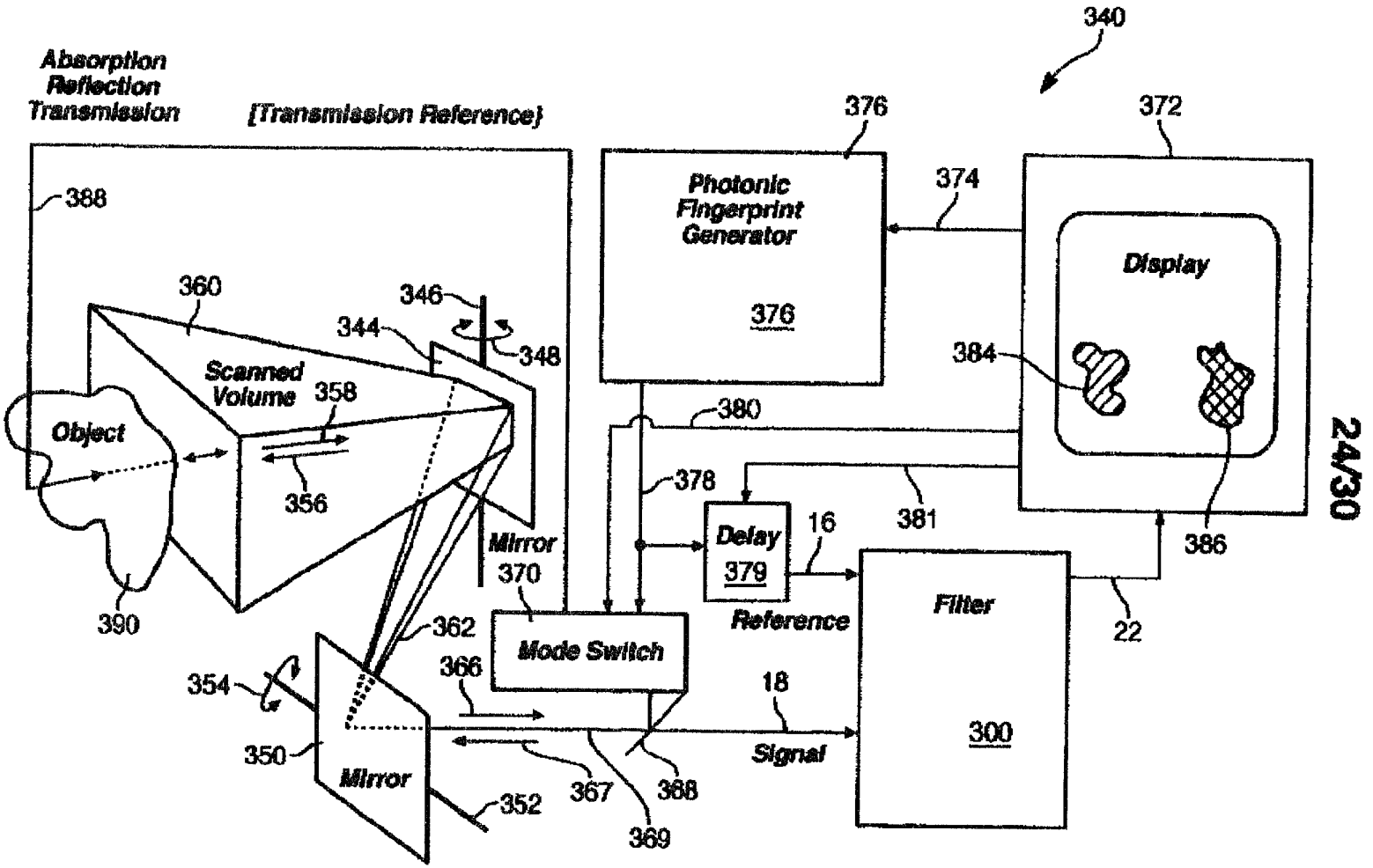

Absorption
Reflection
Transmission
(Transmission Reference)
340
376
372
374
388
Photonic
Fingerprint
Generator
376
Display
360
346
344
348
384
Scanned
Volume
358
Object
380
378
356
381
Delay
379
16
Mirror
370
386
390
362
Mode Switch
Reference
Filter
22
354
366
18
350
Mirror
Signal
300
367
368
352
369

FIG. 24

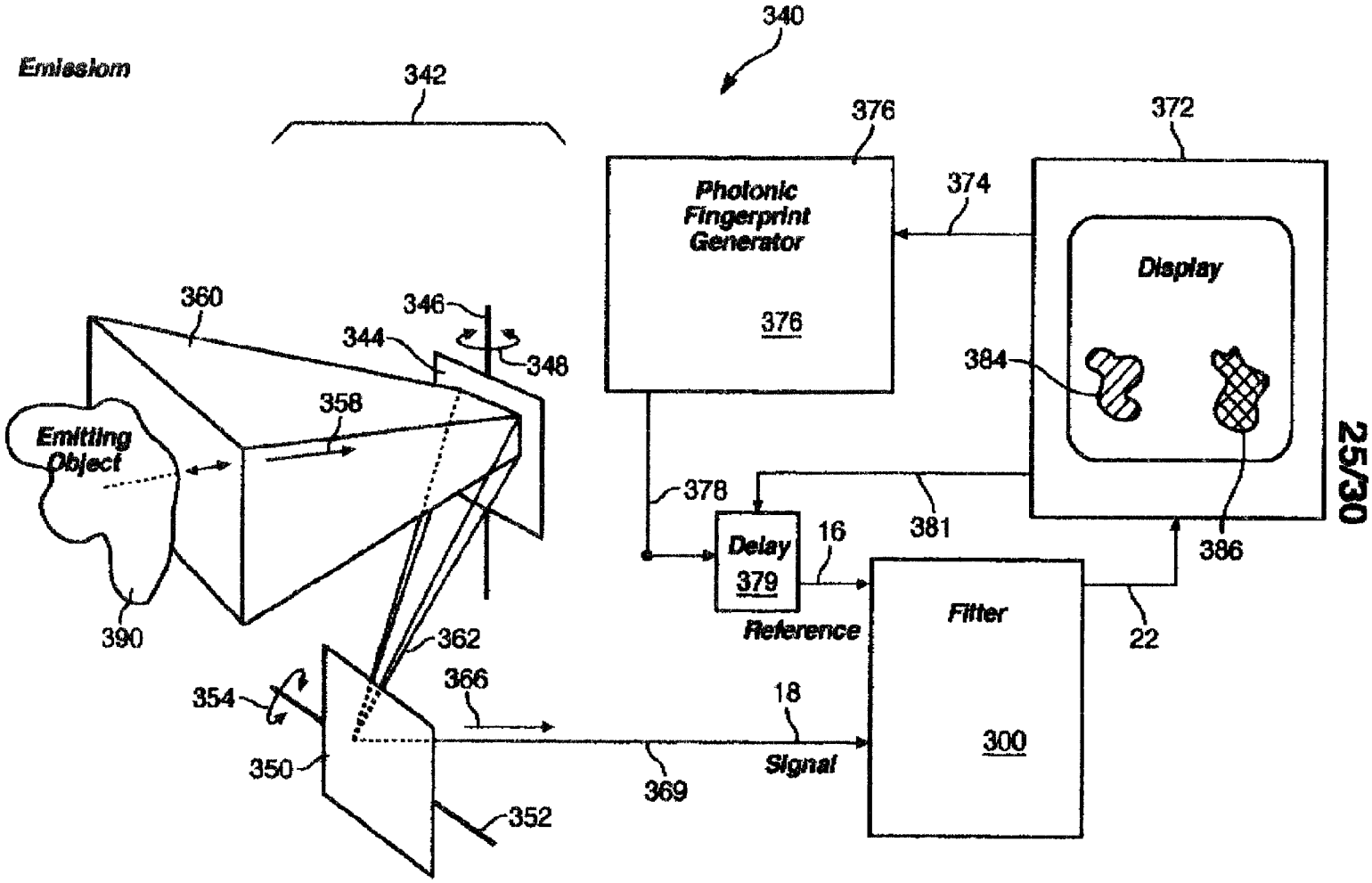

Emission
342
340
376
372
Photonic Fingerprint Generator
376
374
Display
360
346
344
348
384
358
Emitting Object
378
381
Delay
379
16
386
390
362
Reference
Filter
22
366
18
354
300
350
Signal
369
352

FIG. 25

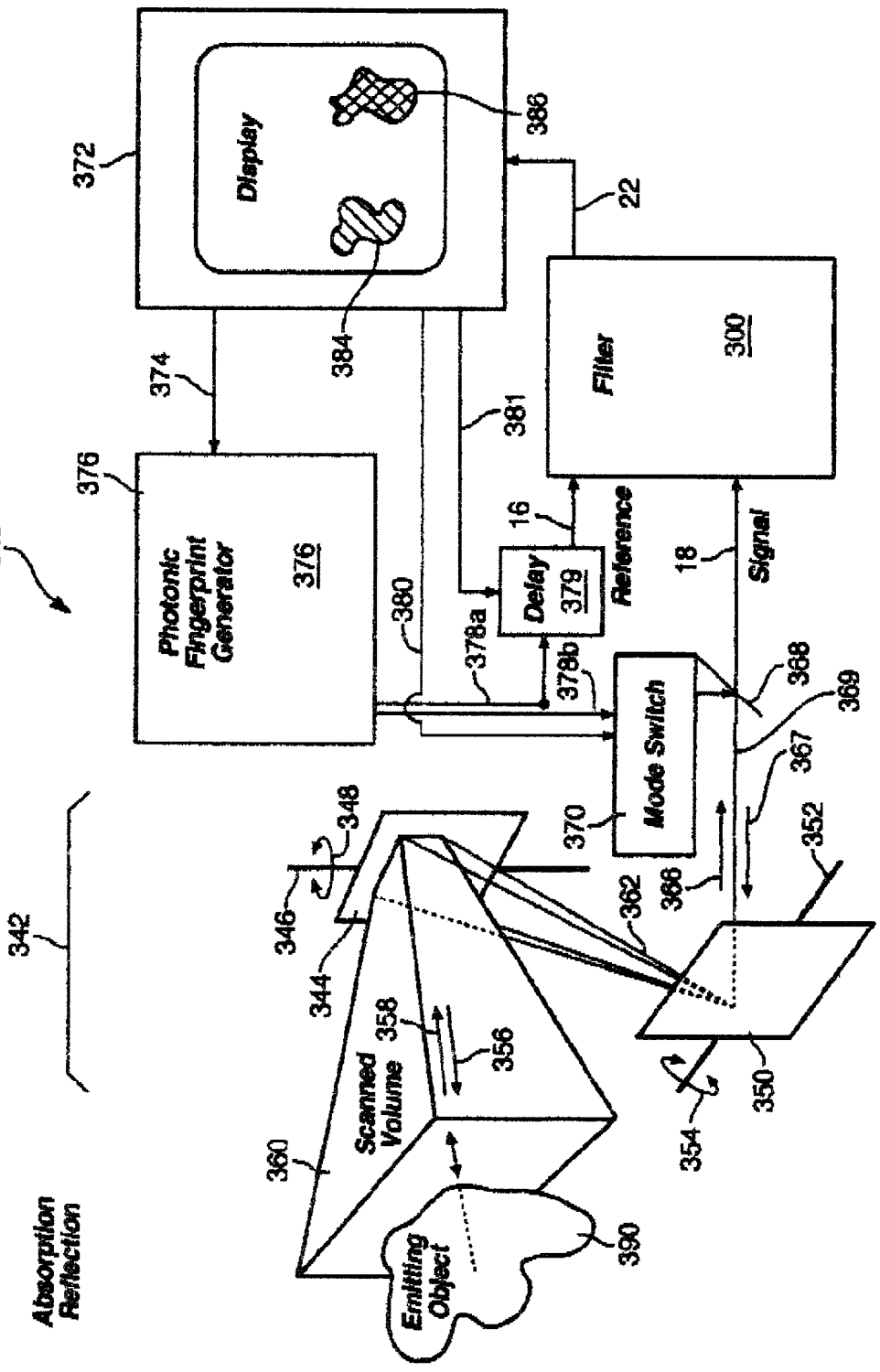

Absorption
Reflection
342
340
Photonic Fingerprint Generator
376
372
Display
386
384
374
376
380
381
Filter
300
22
16
Delay
379
Reference
18
Signal
378a
378b
368
369
367
Mode Switch
370
352
362
366
348
346
344
358
356
Scanned Volume
360
390
Emitting Object
354
350

FIG. 26

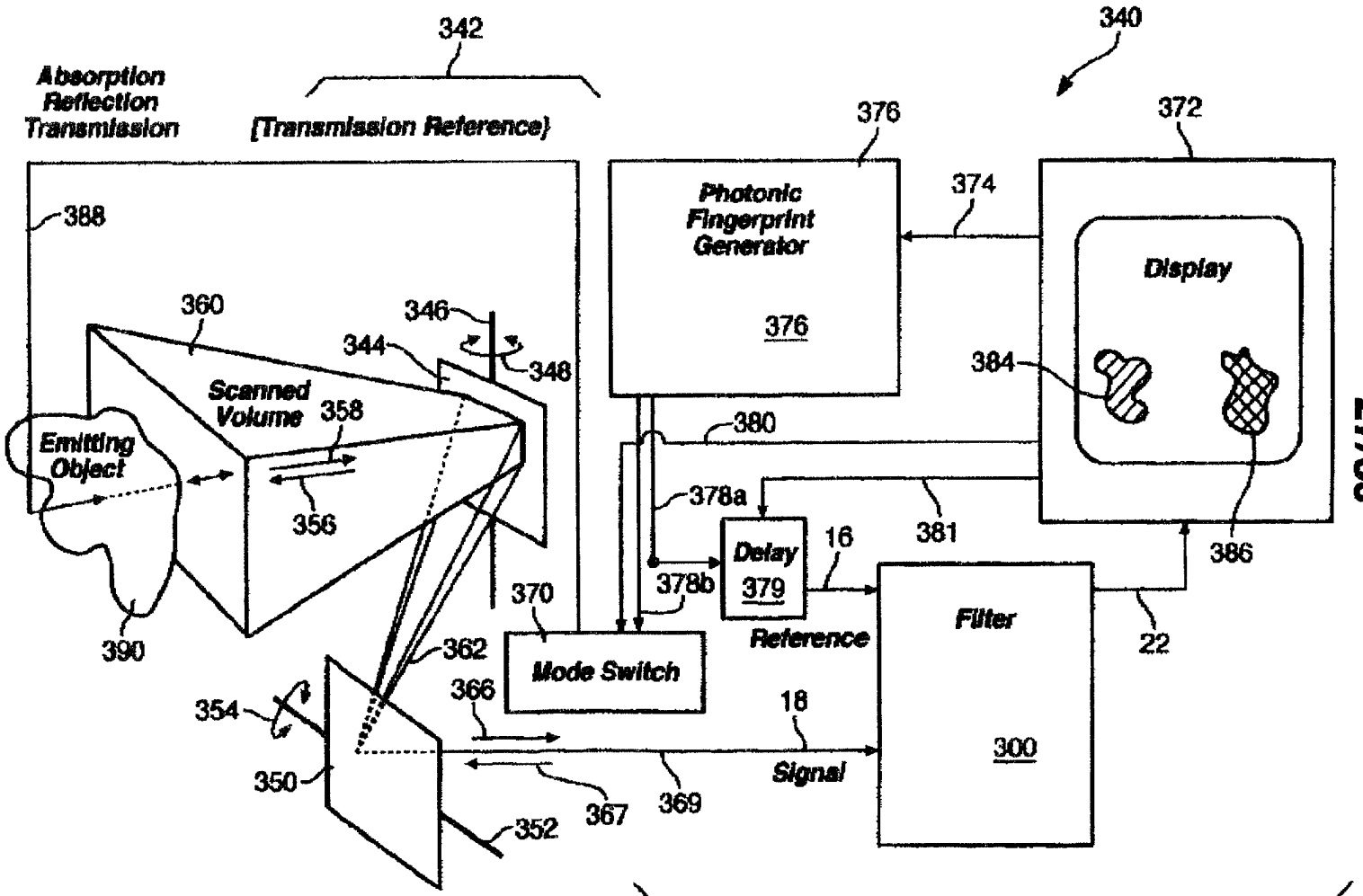

342
340
Absorption
Reflection
Transmission
(Transmission Reference)
376
372
374
Photonic
Fingerprint
Generator
376
Display
388
360
346
344
348
384
Scanned
Volume
358
380
Emitting
Object
356
378a
381
16
Delay
379
386
378b
370
Reference
Filter
362
Mode Switch
22
390
366
18
354
300
Signal
350
367
369
352
343

FIG. 27

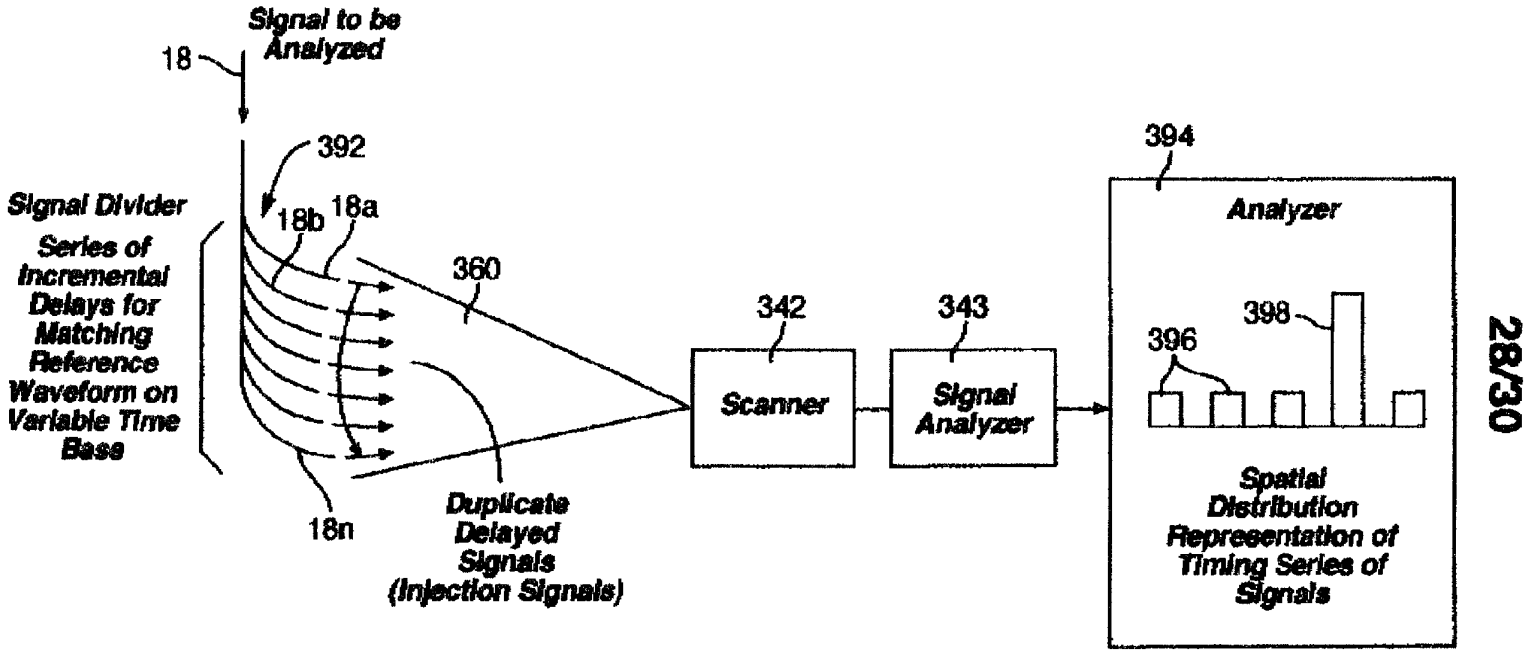

Signal to be Analyzed
18
392
Signal Divider
Series of Incremental Delays for Matching Reference Waveform on Variable Time Base
18b
18a
360
18n
Duplicate Delayed Signals (Injection Signals)
342
Scanner
343
Signal Analyzer
394
Analyzer
396
398
Spatial Distribution Repreeentation of Timing Series of Signals

FIG. 28

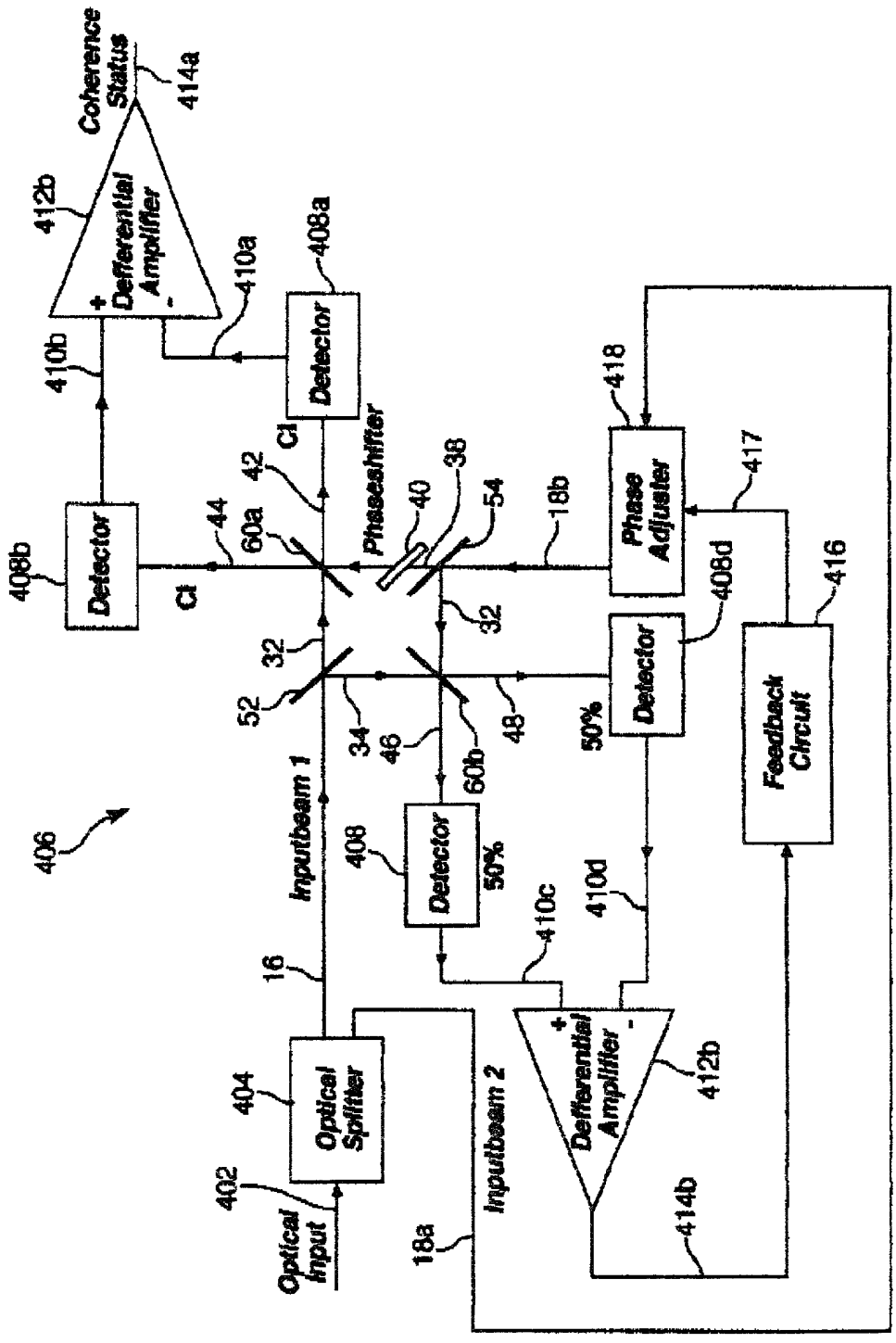

Coherence Status
414a
412b
Differential Amplifier
410a
408a
Detector
410b
Detector
Ci
42
Phaseshifter
40
38
54
18b
Phase Adjuster
418
417
408b
Detector
Ci
44
60a
32
32
52
34
46
60b
48
50%
Detector
408d
416
Feedback Circuit
406
Inputbeam 1
408
Detector
50%
410c
410d
16
Optical Splitter
404
Differential Amplifier
412b
402
Optical Input
18a
Inputbeam 2
414b

FIG. 29

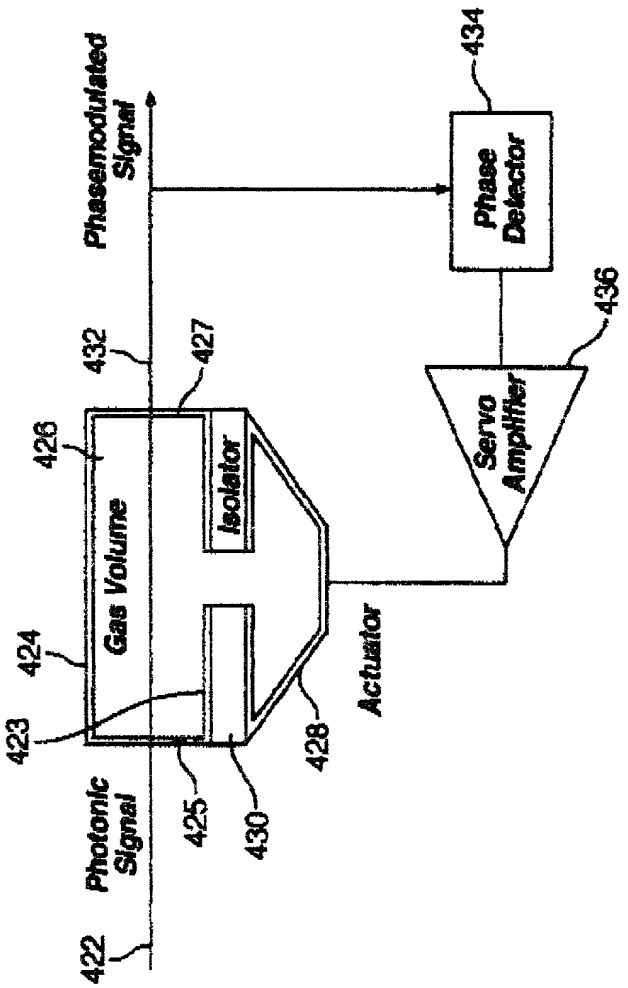

Phasemodulated Signal
434
Phase Detector
436
Servo Amplifier
Actuator
428
Isolator
427
432
426
Gas Volume
424
423
Photonic Signal
425
430
422

FIG. 30